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AUTHOR Hatfield, Robert C.
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ABSTRACT

The author presents a framework for relating learning processes, teaching processes, and subject matter in such a way that specific theories of learning/teaching may be formulated and tested and practical teaching decisions may be made. The basic components of the paradigm are: (1) learning factors (e.g., individual behaviors, personality traits, aptitudes); (2) teaching factors (e.g., focusing activities, informing activities); (3) subject matter; (4) mediating activities (e.g., management of instruction, learning experiences); and (5) the effects on the person resulting from instruction. (MJB)

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A SCIENTIFIC APPROACH TO TEACHING

by
Robert C. Hatfield

A teacher makes decisions and choices of teaching activities which are expected to influence learning in another person. The basis on which these decisions and choices are made represents the professional competence of the teacher and consequently should be a reflection of theory and knowledge about teaching and learning.

Studies of teaching and learning have been predicated on assumptions which suggest that useful theories and knowledge can be derived scientifically. The general implication for such studies is that a teacher possessing this knowledge can provide the most effective learning experiences, in relation to specific subject matter, for a given student with certain personal aptitudes. The student will then learn, under these conditions, the desired outcomes in the most meaningful and efficient manner.

Unfortunately the status of these theories and knowledge at the present time is somewhat vague and uncertain of consequence. And indeed Lesser, in a very relevant book, indicates "...that we should be pursuing the more fundamental search for different methods suitable to different students for achieving both universal and particular goals" (Lesser, p. 534, 1971). In relation to the current implementation of this concept, Cronbach and Snow state that "...adaptation to the individual has been a slogan widely held among educators. But such adaptation has never been systematic because no one has known the principles that govern the matching of learner and instructional environment" (Cronbach and Snow, p. 12, 1977).

Partly as a response to these concerns two basic thrusts have been gaining momentum in psychology and education during recent years, and are now

SP 011 785

providing information which may serve as the key components for developing the kind of theories and knowledge directly applicable for the teacher to use in making decisions about instruction. These thrusts include, (1) the focus on individual differences among persons which influence their learning and learning potential, and (2) the development of teaching processes which provide a sequence of steps to follow in teaching for which learning experiences can be provided.

It is doubtful that all teaching decisions will ever be made on the basis of such scientifically developed knowledge and principles and it is also doubtful if the possibilities for learning will be increased very much unless a substantial number of these teaching decisions do have some predictable consequences for student learning.

The formulation of a scientific approach to teaching will require a descriptive paradigm to facilitate the development of propositions on which decisions about teaching can be reliably made. The essential key to such propositions will probably be the interactions between learning factors and teaching factors for a given subject matter and a given person. Unfortunately the study of teaching and learning in this way has not been a popular endeavor, and it is only recently that a few individuals (Hunt & Sullivan, 1974; Cronbach & Snow, 1977; and Lesser, 1971) have seriously focused on such relationships. Occasional attempts to formulate related concepts were begun over the past 80 years but generally by isolated individuals whose efforts were not translated into usable hypotheses related to teaching. Some other persons such as Bloom (1976), and Mischell (1970), have also pursued similar ideas but few researchers have synthesized the components of teaching and learning into a paradigm which accounts for the numerous variables.

As indicated, a major component of such a paradigm are individual differences as these serve as the base for variability in student learning which the teacher must provide for. Comprehensive descriptions of these differences have been developed by several persons including Tyler (1974), and Bloom (1964).

Teaching processes also constitute a major dimension in such a paradigm and serve as a framework to which the endless number of teaching variables can be related. Good descriptions of such processes are provided by Popham (1970), Kibler (1974), and Hatfield (1975).

A further concern in formulating proposals on teaching and learning interactions is to place the primary focus on individuals. This emphasis will provide direction for developing procedures needed in research and the interpretation of research results. Hunt suggests:

> We believe that the person occupies the central role in any psychological theory and that educational planning should begin with the student rather than with objectives or teaching methods. (Hunt, p. 31, 1974.)

Furthermore Hunt puts the concept of individual differences in perspective:

> ...to describe what a person is like, how he is different from others, and to predict how he will develop and change are probably the most difficult problems facing psychologists, but unless psychologists can cope with these problems, psychology has little to offer education. (Hunt, p. 31, 1974.)

Nature of Teaching:

Teaching is the process whereby a systematic effort is followed to influence what and how a person may have the opportunity to learn. It is the influence on one's perceptual field which serves as the point of interface between the person as a teacher and another person as a student. No effort on the part of the teacher will result in learning by the student

without that student's active participation in the interaction. Even then it may take considerable time before the intended goals are sufficiently assimilated by the student for recall or for processing further information (Fincher, p. 39, 1976).

Teaching, therefore, represents the provision of certain mediating activities which will affect the perceptual field of the student either cognitively or affectively. The mediating activities may vary widely with no specific ones being essential for one student to use since learning is an internal phenomenon that is subject to each individual's idiosyncratic behavior and susceptible to a wide variety of experience (Gage, p. 31, 1972; and Ausubel, p. 76, 1963).

The teacher can facilitate systematic learning by following a certain sequence of steps each of which is designed to meet certain purposes. These steps (teaching process) need to meet the conditions necessary for attending, perceiving, organizing, and structuring information, and to provide the practice, feedback, and correction necessary to obtain an accurate and complete assimilation of information by the individual in order to structure his/her own pattern of behavior (Gagne, p. 121-135, 1974). These several purposes need to be provided or met regardless of the type of methodology being used.

Despite the possibility of designing learning activities which may be very powerful in the sense of predicting the changed behavior of an individual who participates in a given experience it is essential, in a democracy, that the conditions under which learning takes place provide a person with some choice. This choice, in any case, will need to be considered at the initial levels of almost any teaching situation if ultimate success is anticipated (Broudy, p. 39, 1961; and Lecky, p. 178, 1961). In this connection it is

the teacher's role to facilitate the systematic approach to education influencing the choice of what is studied and how it will be taught (Broudy, p. 5-8, 1961).

Proposed Paradigm:

The development of this idea needs to follow from our best conceptions of theory and research development. Reynolds (1971) has provided a conceptual model to use in education which might well serve as a guide. Following this procedure the first step should describe an overall paradigm which will serve to generate hypotheses which can in turn be tested and eventually can be stated in the form of propositions. These propositions will then serve as the basis for decision making by the practicing teacher. Any such paradigm, to be useful, must meet these two basic criteria: (1) Specific theories can be formulated and tested; and (2) Actual decisions about teaching practice can be made on the basis of the research results.

The paradigm presented here will reflect these criteria and will provide for the integration of most facets of teaching and learning which are important to the practicing teacher. The general thrust of the paradigm is to relate student aptitudes (learning factors), to the several steps of a teaching process (teaching factors), and the subject matter. Combining these three dimensions of teaching and learning into a teaching-learning interaction paradigm provides a basis for describing relationships which can be directly used by a teacher in dealing with individual differences in learning.

Additional considerations of a paradigm include the flexibility to include direct vs. indirect interactions, cognitive vs. affective content, and authoritative vs. supportive environments as all of these variations are sometimes necessary for effective learning to occur. The proposed paradigm

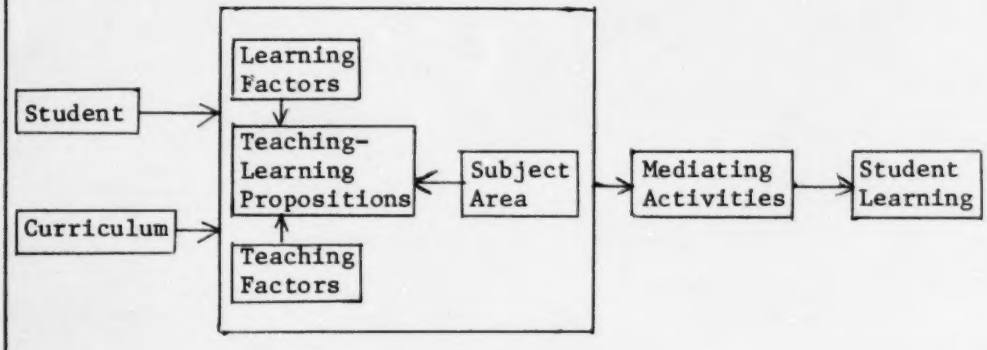
is essentially neutral regarding curriculum, methodology, and interaction since it is focused on affecting the optimal learning and growth for each individual student. There is no thought that this paradigm is exclusive or that it will be static, however, it could serve as a starting point for reorganizing past research studies and developing new ones.

The basic components of the paradigm include: (1) learning factors (i.e. individual behaviors, personality traits, aptitudes, etc.), (2) teaching factors (i.e. focusing activities, informing activities, etc.), (3) subject matter, (4) mediating activities (i.e. management of instruction, learning experiences, etc.), and (5) the effects on the person resulting from instruction. (See Diagram I.)

The subject matter area is included because there is some evidence indicating that this is also a major variable in the type of interactions obtained (Lesser, p. 547, 1971).

DIAGRAM I

TEACHING-LEARNING PARADIGM

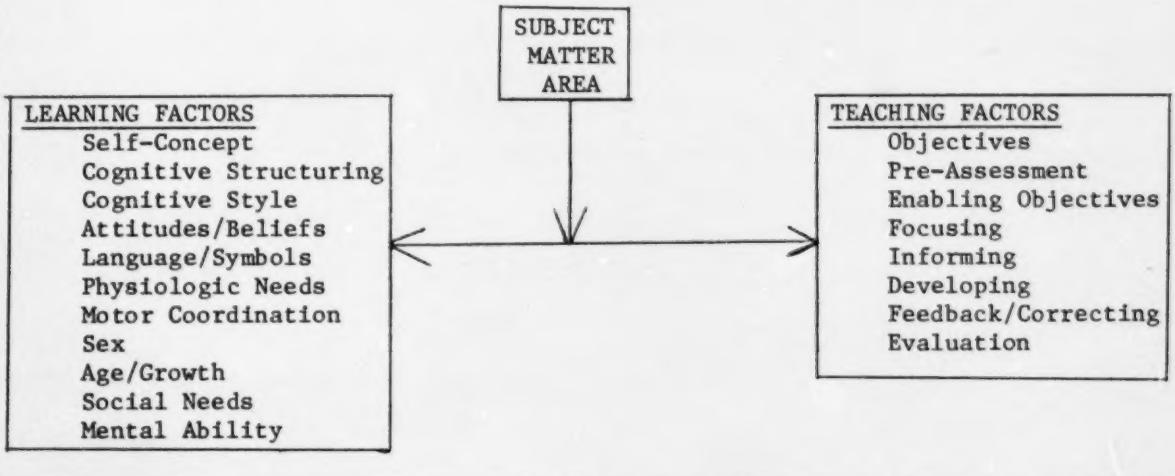


A unique feature of the paradigm is that the learning factors are related to a teaching process instead of to the mediating activities which has been the usual practice. In this case learning factors are defined as those items which may have an influence on the learning or learning ability of an individual person. Such items have frequently been classified as personality traits, behavior, or aptitudes, but because of the diversity and difficulty of relating to any one of these terms, they are being referred to as learning factors. Such items as self-concept, sex, cognitive structuring, and general mental ability, may all be included as learning factors. Learning factors are only tentatively suggested and will need extensive research to identify those factors or elements of them which are most important in learning.

Teaching factors, as reflected by a teaching process, may include items such as pre-assessment, activities for focusing on the objective, and developmental activities. (See Diagram II.)

DIAGRAM II

FACTORS IN TEACHING-LEARNING INTERACTIONS



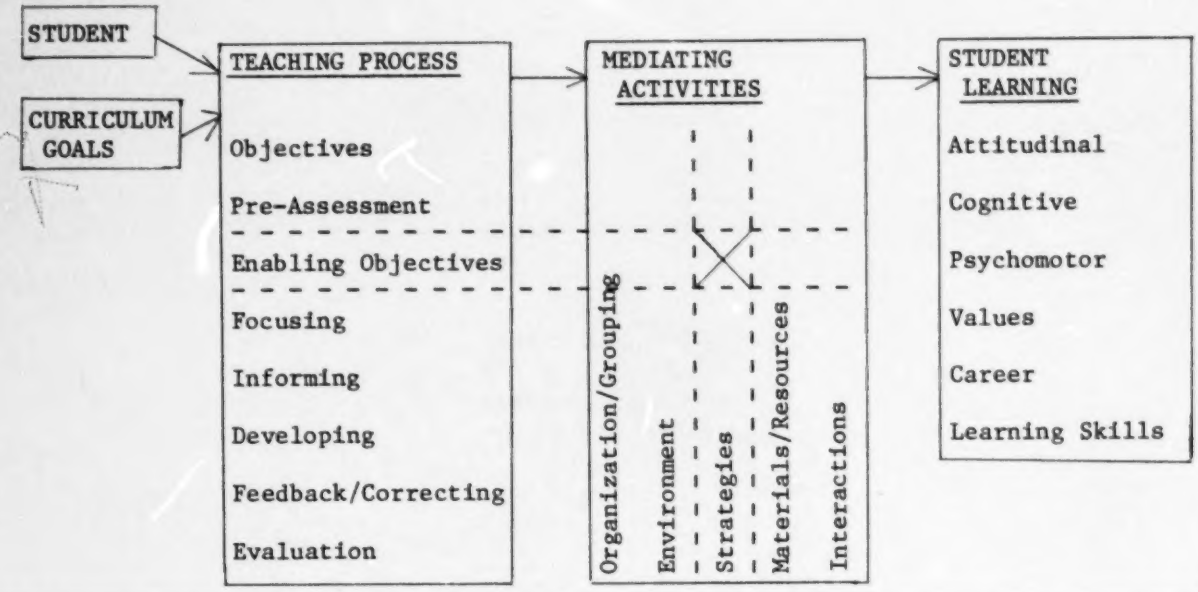
It is difficult at this stage in the development of the paradigm to suggest how the actual relationships might be stated. However, to help clarify the potential implications and use of such propositions some examples will be attempted. One example might read: A 10 year old boy studying science and having a low self-esteem requires frequent and direct feedback. Another example states that: A 17 year old girl studying math is visually oriented and requires a focusing activity which is of a schematic nature. The propositions of other teaching-learning interactions important to a given person would also need to be considered when deciding on the specific mediating activities to implement with a student.

Propositions developed through research studies would be applied by the teacher for particular students when deemed appropriate. It is probable that a limited number of the potential interactions (between teaching and learning factors), would need to be considered at one time. However, the propositions developed would be known by a teacher and utilized when and where necessary.

Actual application of these propositions by the teacher is through a process which involves the formulation of a teaching model using the several teaching factors as listed in the paradigm. Each of the factors serves as a guide for the development of objectives/activities which form the actual mediating activities by which a student gains the necessary experiences to learn and/or develop. The mediating activities can be classified as; organization/grouping, environment, strategies, materials/resources, and interactions which collectively are designed to meet the purposes indicated by the teaching process and which have been found to provide the type of conditions which are called for in the relevant propositions being considered by the teacher (Hatfield, p. B 1 - 33, 1977). (See Diagram III.)

DIAGRAM III

TEACHING MODEL BASED ON TEACHING-LEARNING PARADIGM



It is also important to note that within the context of the steps indicated in this teaching process both objectives and mediating activities may vary from those that are teacher formulated and directed to those which can be student formulated and directed. The decisions relating to these approaches should be based on the propositions being used with the particular students.

Further Research:

The proposed paradigm is designed to bring into a unified structure the wide variety of elements related to teaching and learning: (1) which will facilitate further research into teaching; and (2) which at the same time will provide the teacher with a scientific base of knowledge on which to make predictive decisions regarding the instruction of a particular student for a given objective.

The development of a research base for this paradigm will require an extensive collection of data on teaching and learning and should utilize the case study description approach oriented to the components that have been described. The reason for the case study approach is so that detailed information relating to specific individuals can be collected and used in formulating tentative hypotheses regarding possible interactions among the major dimensions. In addition the collection of such data should be relatively easy, though time consuming, and should allow a large number of teachers, teacher candidates, and researchers to cooperate in this task. The data itself can then be used for research analysis, teacher training, and the development of new and different paradigms.

Following extensive case study analysis, comparative and experimental studies would be appropriate to identify and test hypotheses for the development of propositions describing the interactions which prove to be important.

Summary:

This paradigm has the potential to generate numerous research studies and to provide a structure for the interpretation of many previous studies. The general description is not elaborate but does reflect the concepts about teaching mentioned previously and the criteria for a paradigm which relates to both teaching and research. In addition, modification and restructuring of the components of the paradigm should be relatively easy when research studies provide a justification for such changes.

The ultimate hope for this proposal is that practicing teachers can make decisions regarding their interactions and activities with students that are based on propositions which have a high level of predictable consequence for student learning. It is hoped that with this kind of knowledge base teaching

will become more effective, professional, and will facilitate the development of mediating activities for students which provide for the most effective growth.

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